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March 16th, 1848. (Stated Meeting).

REV. HUMPHREY LLOYD, D. D., PRESIDENT,
in the Chair.

THE following Report from the Council was read by the Secretary :

The Council are happy to be able to announce that the second part of the twenty-first volume of the Transactions of the Academy is now ready, and will be delivered to Members in a few days.

It contains some very valuable papers, in each of the three departments of the Academy's objects: amongst which it may suffice to particularize, in the department of Science, Mr. Haughton's very beautiful Essay on the Equilibrium and Motion of solid and fluid Bodies; and Sir William Hamilton's theory of Quaternions. This theory is as yet in its infancy, but there is every reason to believe that it will ultimately become a recognised branch of Mathematics. If so, the Academy will share with its illustrious author in the honour of having produced the greatest improvement in pure analysis that has been made since the time of Des Cartes. The application of this Calculus to the theory of the Moon has already been found to introduce great simplifications into the laborious and complicated investigations necessary in the ordinary method of co-ordinates; and has solved the Newtonian problem of the disturbance of the moon by the sun, to the extent of the third dimension of the distance. In its application to the system of the world, the well-known principles of the conservation of the *vis viva*, and of areas, and other laws of planetary motions in their most general form, are amongst the earliest and most elementary of its results.

Another important feature of the volume will be found to be the papers in the department of Polite Literature, by Dr. Hincks and Dr. Wall, upon the Hieroglyphic or ancient Egyptian alphabet, and upon the three kinds of Persepolitan Writing. These subjects, it is well known, have already engaged the attention of the most eminent scholars of Europe, and it is hoped that the additional light thrown on them in the present volume of the Transactions

will be recognised with interest by the learned world, and add to the reputation already so justly earned by the authors of the papers referred to.

The Proceedings have been published during the past year with great regularity, and an inspection of them will show that there has been no lack of valuable communications, on various branches of Science and Antiquities, at the meetings of the Academy during that period.

The most important subject which has occupied the attention of the Council during the past year, is one upon which their deliberations have only just closed, and they have now to make known the result to the Academy for the first time.

The regulations for awarding Medals and prizes from the Cunningham bequest, have long been felt to be unsatisfactory, and have not been found to work well. The Council accordingly have given the subject much consideration, and have resolved to adopt a modification of the former rules which it is hoped will have a beneficial operation.

Hitherto the Medals, as the Academy are aware, were given only to the authors of papers published in the Transactions; it is now resolved to include, in the list of eligible candidates for this distinction, the authors of all works of merit printed and published in Ireland, or relating to Irish subjects. It has been thought right to make this limit, because it is obvious that a limitation of some kind is necessary, and this appeared to be directly pointed out by the intention of the Cunningham bequest, which was manifestly designed to encourage the pursuit of learning in this country.

Another very important alteration in the former rules is this :— It has been resolved to offer prizes in money for Reports or Essays on given subjects, in theoretical and practical Science, Antiquities, and other departments of Literature. This, it is hoped, will be found to open up a new field for a most useful application of the fund. It will enable the Academy to obtain from the persons best qualified an account of the progress and actual state of our knowledge, with statistical details, if necessary, of a practical and useful character. An important machinery will thus be within our reach for directing public attention to scientific or antiquarian subjects,

and for collecting and preserving information that would otherwise, perhaps, be inevitably lost; and it will always be in the power of the Academy to select the most competent person for making such Reports; and to award to him a prize proportioned in value to the time and cost of the investigation, or else to throw the prize open to competition, and to adjudge the reward to the Essay that is found to be the most complete and satisfactory.

The following are the regulations as finally agreed to by the Council :

“ 1. That Medals given under the Cunningham bequest be open to the authors of all works or essays in the departments of Science, Polite Literature, or Antiquities, which shall be printed and published in Ireland, or which shall relate to Irish subjects.

“ 2. That the award of Medals be taken into consideration by the Council every third year, at the first meeting after the 16th of March, and that it be confined to papers or works published within the six years preceding.

“ 3. That the Council shall, from time to time, grant money premiums for Reports or Essays upon stated subjects, reserving to themselves the power of printing the papers or not, as they deem expedient.

“ 4. That at the next award of Medals, the papers contained in Vols. XIX. and XXI. be taken into consideration.

“ 5. That the existing regulations, as to the manner of deciding on papers for Medals, shall continue in force.”

The Library during the past year has been enlarged by several valuable donations, which have been acknowledged from time to time in the Proceedings. It has also been added to by purchase : but, from the limited funds at the disposal of the Council, these purchases have necessarily been but few, amounting in all to the sum of £99 10s., which includes the annual subscriptions of the Academy to scientific and literary Journals and Reviews.

The Museum has also received many valuable donations, which have been enumerated in the Proceedings. Among them it may be permitted to the Council to notice, from their peculiar magnitude and value, the Antiquities presented by Lord Farnham, and by our constant benefactors, the Shannon Commissioners, to whom the spe-

cial thanks of the Academy were voted for additions to our National Museum of very singular interest and importance. The Museum has also been increased during the past year by purchases made out of the funds placed by the Academy in the hands of the Committee of Antiquities for that purpose, to the amount of £61 10s. 6d.

The Council recommended to the attention of the Academy, in the course of last summer, the important work undertaken at the suggestion of the Committee of Antiquities, of investigating the interior of the ancient Tumulus of Dowth. As the Committee have not yet made their Report on the results of the excavations, it is only necessary to congratulate the Academy in general terms on the commencement that has been made, by these operations, of a scientific and dispassionate examination of our ancient monuments. Nor will the cost of the work be a subject of regret, when it is remembered that these singular structures are almost the only records that exist of the people who were perhaps the first colonists of Ireland, and whose progress may be traced, by the existence of similar monuments, over a large portion of the north of Europe. The importance of such investigations, therefore, considered as a source of history, and as a means of mapping the migrations of the human race, can scarcely be overrated. But for the present the operations of the Committee have been suspended for want of funds; they hope, however, very soon to lay before the Academy a full account of what has been done, together with sectional plans and drawings, for which they are indebted to Mr. Frith. To the professional skill and disinterested co-operation of that gentleman they are under great obligations, as well as for the constant superintendence he has given to the work, without which it would have been impossible for the Committee to have completed their operations with the strict attention to economy which has been observed.

Another subject of national interest has also engaged the attention of the Council during the past year.

Sir William Betham having intimated to the Council that he was anxious to dispose of his collection of Irish MSS., a Committee was appointed to examine them and report on their value. The re-

sult was an offer on the part of Sir William Betham to sell the MSS. to the Academy for the sum of £1000, which he subsequently reduced to £800, from his wish to have them preserved in Ireland, although he could have obtained (as the Council are assured) the original sum at which he valued them, if he would consent to dispose of them elsewhere. The Committee having reported that the Manuscripts were well worth the price expected for them, and that they would be a valuable addition to our Library, it was resolved to make an attempt to raise the sum required. A new demand was, with great reluctance, made on the liberality of our Members and of the public: the subscription list was headed by a donation of £100 from the Academy, and a memorial was presented to the Lord Lieutenant, in the hope of obtaining a portion of the purchase-money for this national object, through his Excellency's influence with Her Majesty's Government.

The final answer to this memorial has not yet been received. His Excellency has expressed the warmest interest in the object proposed, but it is obvious that the present financial condition of the country renders the present a peculiarly unpropitious time for an application to Government for such a purpose. The subscriptions already promised do not amount to above a third of the required sum; and it is to be feared that, unless a very great exertion is made, Sir William Betham will be compelled to dispose of his manuscripts elsewhere.

During the past year twenty-five new Members have been elected into the Academy, and we have lost, by death, four honorary and eight ordinary Members; so that the total number of Members now on the list of the Academy is,

Honorary,	61
Ordinary,	395
	<hr/>
Total,	456

The new Members elected during the year now closed are the following:

Abraham Whyte Baker, Jun., Esq. Right Hon. Sir Thomas Esmonde,
 James W. Middleton Berry, Esq. Bart.
 Richard Vicars Boyle, Esq. Nathaniel Hone, Esq.

Philip Jones, Esq.	Wm. Thos. Lett, Esq., F. T. C. D.
Edward Barnes, Esq.	George Miller, Esq.
Henry Freke, M. D.	Henry Wilson, M. D.
Arthur Sidney Ormsby, Esq.	Frederick Clarendon, Esq.
John C. Egan, M. D.	Rev. Matthew Newport, D. D.
Eaton Hodgkinson, Esq.	Charles Ottley, Esq.
Henry Croly, M. D.	O'Neale Segrave, Esq.
John Grene, Esq.	Matthew E. Talbot, Esq.
Alexander H. Haliday, Esq.	Charles Tarrant, Esq.
James Hartley, Esq.	Rev. J. J. Taylor, D. D.

We have also to lament the decease in the same period of several very eminent Members of our body. Among them are the following Honorary Members :

NICHOLAS CARLISLE, Esq., who died at Margate on the 27th of August, 1847, in the seventy-seventh year of his age. Mr. Carlisle was one of the Secretaries of the Society of Antiquaries, an office which he had filled for a period of more than forty years. He is known by his very valuable works on topography and heraldry.

MISS CAROLINE LUCRETIA HERSCHEL, who died at Hanover, on the 9th of January, 1847, at the very advanced age of 98. Miss Herschel was sister to the celebrated astronomer, Sir William Herschel. She was born at Hanover, March 16, 1750, and in 1772 removed to England to join her brother, who was then at Bath, engaged in the profession of a musician. When he commenced his astronomical pursuits she was his constant assistant, both as a calculator and as an observer, for which duties she subsequently received a salary from the munificence of George III. She was also engaged in constant labours of her own, made with a small Newtonian telescope, which stood on the lawn of her brother's house, and with which she was in the habit of making regular observations. The following extract from the address of Sir James South, on presenting her with the Medal of the Astronomical Society, on the 8th of February, 1828, will explain the nature and success of these labours :

“ But her claims to our gratitude end not here ; as an original observer she demands, and I am sure she has, our most unfeigned thanks. Occasionally her immediate attendance during the obser-

vations could be dispensed with. Did she pass the night in repose? No such thing; wherever her illustrious brother was, there you were sure to find her also. A sweeper planted on the lawn became her object of amusement; but her amusements were of the higher order, and to them we stand indebted for the discovery of the comet of 1786, of the comet of 1788, of the comet of 1791, of the comet of 1793, and of the comet of 1795, since rendered familiar to us by the remarkable discovery of Encke. Many also of the *nebulæ* contained in Sir William Herschel's catalogues were detected by her during those hours of enjoyment. Indeed, in looking at the joint labours of those extraordinary personages, we scarcely know whether most to admire the intellectual power of the brother, or the unconquerable industry of the sister.

"In the year 1797, she presented to the Royal Society a catalogue of 560 stars taken from Flamsteed's observations, and not inserted in the British Catalogue; together with a collection of errata that should be noticed in the same volume.

"Shortly after the death of her brother, Miss Herschel returned to Hanover. Unwilling, however, to relinquish her astronomical labours whilst anything useful presented itself, she undertook and completed the laborious reduction of the places of 2500 *nebulæ*, to the 1st January, 1800, presenting in one view the results of all Sir William Herschel's observations on these bodies; thus bringing to a close half a century spent in astronomical labour."*

For this last laborious and useful work she was presented with the medal of the Astronomical Society of London in the year 1828, and afterwards elected an Honorary Member of that body. For the same work she was also subsequently elected an Honorary Member of this Academy, November 12, 1838.

M. ALEXANDRE BROGNIART, at the age of 78, died about the beginning of October last; the exact day has not been ascertained. He was a native of Paris, where he was born about the year 1773. In 1800 he was appointed to the office of superintendent of the national manufactory of porcelain at Sèvres, in which employment he continued to his death. Before that time, however, he was known

* Memoirs of the Astronomical Society, vol. iii. p. 410.

as a mining engineer, and had published a treatise on enamelling, which attracted the attention of M. Berthollet, and procured for him the appointment of the porcelain works at Sèvres, which he held till his death. In 1807 he published his "*Traité élémentaire de Minéralogie*," a work which still maintains its high character. He was also an eminent student in zoology and geology, on which latter subject he is known by his work, published in 1822, in conjunction with Cuvier, on the geology of the environs of Paris.

He was elected a Member of the French Academy in 1815, and in the same year he became a Foreign Member of the Royal Society, of London. In June, 1825, he was elected an Honorary Member of this Academy.

In practical science he is known by his works on pottery, suggested by his situation as superintendent of the great manufactory at Sèvres.*

We have also to record the decease of another eminent Honorary Member, DR. THOMAS TAYLOR, who was carried off, by fever, in the early part of last month.

Dr. Taylor was one of the most distinguished cryptogamic botanists of the present day. Ardently attached to botany from very early years, and endowed with an acute eye, and keenly-discriminative powers of mind, he soon became known as an observer; and to his researches the Irish Flora is indebted for the detection of a large number of new species.

These researches continued with unabated zeal through life. In 1818, in conjunction with Sir William Hooker, he published the "*Muscologia Britannica*," a work which, for accuracy and clearness has seldom been surpassed, and which is still the best guide to a knowledge of the British mosses. In 1827 it went through a second edition. His other botanical writings are: an elaborate monograph of the *Marchantia*, published in the seventeenth volume of the Transactions of the Linnæan Society of London; the articles *Mosses* and *Lichens* in the Flora Hibernica; and numerous papers in Hooker's London Journal of Botany, chiefly on exotic cryptogamia. Besides

* See the notice of M. Brogniart, in the Address delivered by the Marquis of Northampton to the Royal Society, on the 30th of November last.

these, he assisted Dr. Joseph Hooker in the cryptogamic portion of the Flora Antarctica. During some years Dr. Taylor was Lecturer on Botany and Natural History in the Royal Cork Institution ; but on the withdrawal of the parliamentary grant he retired to an estate in the County Kerry, near Kenmare, where he continued to reside for the remainder of his life, employing himself in country business, and devoting to botany his leisure time. As a magistrate, he twice received the marked thanks of the Government. In the late season of awful misery, his purse and his medical skill were freely employed in alleviating the sufferings of his poorer neighbours ; and it was *fever*, caught in the discharge of his duties at the work-house of Kenmare, to which he was physician, which terminated his useful life at an age very little exceeding 60. Strong in frame, and remarkably active, he might have looked forward to a more lengthened career.

Dr. Taylor was in correspondence with the most celebrated botanists of England, France, Germany, and America, by whom he was universally esteemed. "He possessed," in the language of an early friend, "a mind well stored in the various branches of science and literature, while his gentle and amiable manners rendered him a great favourite with all who had the happiness of his acquaintance." His loss is deplored by a wide circle of scientific and personal friends. He received the well merited honour which has connected his name with this Academy in the year 1816.

We have also lost by death, during the past year, eight ordinary members, whose names are as follows :

The Rev. John Cramer Roberts, elected a member of the Academy, 28th April, 1792.

Samuel Litton, Esq., M. D., elected 16th March, 1815.

James Mac Cullagh, Esq., LL.D., elected February 25, 1832.

William Hill, Esq., elected 10th June, 1839.

The Rev. Robert Trail, D. D., elected 13th April, 1840.

Joseph Nelson, Esq., Q. C., elected 1st February, 1842.

James Jameson, Esq., elected 14th April, 1845.

John Oliver Curran, Esq., M. B., elected 13th April, 1846.

DR. SAMUEL LITTON was one whose literary attainments and private virtues endeared him to all who had the privilege of his ac-

quaintance. He was the son of Mr. Edward Litton, who, although a native of Ireland, had settled in Liverpool, where, after the failure of some commercial speculations, he became the master of a mercantile school, and acquired a high literary reputation. Our late lamented friend was, therefore, a native of Lancashire; and in the year 1795 he entered Trinity College, Dublin, having selected for his tutor the late Dr. Magee, then a Fellow of the College, and subsequently Archbishop of Dublin. It was usual then, as it is now, for the students from that part of England to return to their friends after each examination, and this course appears to have been adopted by young Litton, until his election to a scholarship rendered his residence in the College a matter of necessity. As intercourse by sea with Liverpool was not then as easy as it is now, it is no cause of wonder that Litton, although eminently distinguished in the undergraduate course, failed to fulfil the conditions that were then necessary for obtaining the gold medal at the degree examination. It will be remembered that this medal was then given, not, as now, to the best answerer at a severe examination, but to the student who, during his whole undergraduate course, had never omitted an examination nor obtained, at any one examination, judgments below a certain standard. In point of fact, the gold medals in Dr. Litton's class, which graduated in 1800, were obtained by the present Vice-Provost, and by another very eminent scholar, the lamented John Ormston.

At his graduation in 1800, Litton must have been about twenty-three or twenty-four years of age; and he appears at first to have contemplated studying for a fellowship. At the fellowship examination of 1801, however, he did not sit, for his father died at the close of the year 1800; and this circumstance, requiring him to be absent from College, would naturally have interfered with his studies, even if the time had sufficed to enable him to prepare himself with any prospect of success.

From 1801 to 1805 there was no vacancy for fellowships; and although during that period young Litton continued occasionally to attend the mathematical lectures, yet when the time came he did not present himself as a candidate. The fact is, that his habits of general discursive reading, his taste for natural history and bo-

tany, and for the lighter branches of literature, were inconsistent with the severe and condensed application which the fellowship examination requires.

Dr. Litton was probably decided to devote himself to the medical profession by his predilection for the natural sciences, and by his intimacy with the late eminent Dr. Robert Perceval, of Manchester. He took his medical degree at Edinburgh, in the year 1806.

In 1809, on the death of Dr. Robert Scott, he was a candidate for the chair of botany in the University, to which the late Dr. Allman was then elected. But soon afterwards he was elected Professor of Natural Philosophy to the Dublin Institution, where he delivered lectures that attracted much attention. He was also a Fellow of the College of Physicians, one of the Physicians to the House of Industry, and Professor of Natural History to the Apothecaries' Hall. But he was chiefly known by his long connexion with the Royal Dublin Society. He was elected Librarian to that institution in 1814, and Professor of Botany in 1826, which latter office he enjoyed till his death.

In 1815 he was elected a member of the Academy, and in the following year he was placed on the council, where he continued to serve to the day of his death, a period of thirty-one years. In 1833 he was appointed Vice-President of the Academy, in which office he continued until 1840, when he resigned to make way for the new rule of rotation then agreed upon.

His death was very sudden. On the day of his death he delivered his usual lecture in the Theatre of the Royal Dublin Society; and afterwards, although he had been complaining during the day of indisposition, he went to dine with a friend at Rathmines. He left the house at eight o'clock, and after walking some distance, was seized with such violent pains in the chest as to attract the notice of a gentleman passing by, who kindly placed him on a car, and accompanied him to Dr. Leet's, in St. Stephen's-green, where he soon after expired. His disease was angina pectoris, and his death took place on the 4th of June, 1847.*

* A short Memoir of Dr. Litton, with an engraving, has appeared in the Dublin University Magazine.

Another eminent Member of Council, who has largely contributed to the fame of this Academy, and of the University to which he belonged, was JAMES MAC CULLAGH.

He was born in the County Tyrone, in the year 1809, in the parish of Upper Badony, about ten miles from Strabane. At a very early period of his life he was put to school at Strabane, to which town his father had removed, chiefly for the purpose of obtaining the means of education for his son. His taste for mathematical pursuits was soon perceived, but from the want of well qualified instructors, he had great difficulties to contend with. It is said that he was set to learn the demonstrations of Euclid by heart, without any reference to the diagrams, or any attempt to understand the reasoning. This was peculiarly distateful to his active and inquiring genius, and produced an uneasiness which caused a rebellion in his mind against the unintellectual task to which he was condemned. In his distress, it is said that he was led accidentally to communicate his perplexity to a neighbour, a working carpenter, but a man of some intelligence and information, who had the high honour of first communicating to the mind of Mac Cullagh the perception of a geometrical demonstration.

Having outstripped his teachers at Strabane, he was sent to the school of the Rev. John Graham, at Lifford, and afterwards to that of the Rev. Thomas Rolleston. He entered Trinity College, Dublin, in November, 1824, as a pensioner, and in the following year he obtained a sizarship. Throughout his undergraduate course he was eminently successful both in classics and science. In 1827 he was elected a scholar, and in 1832 he obtained a fellowship.

In 1835 the Professorship of Mathematics having been placed under new regulations, in virtue of a Statute then recently obtained from the Crown, Dr. Sadleir, the present Provost, resigned the office, and Mac Cullagh was appointed Professor.

In February, 1833, he was elected a Member of the Academy, and in 1838 was put upon the Council, where he continued to serve to the day of his death. In 1844 he was elected Secretary to the Academy, which office he resigned at the beginning of 1846.

In 1843, the Chair of Natural Philosophy in the University

became vacant, by the appointment of Dr. Lloyd to a senior fellowship, and Mac Cullagh was elected to it without opposition.

These are the principal events and dates of a life spent in the peaceful pursuits of learning, and in the diligent discharge of academic duties. In reviewing the labours which were the result of that life, it will be necessary, in the first instance, to give some account of the papers published in the Transactions of this Academy, containing the researches in Mathematical and Physical Science, on which the fame of Mac Cullagh chiefly rests.

His first papers were read here, before he had become a Member of the Academy, and before he was elected a Fellow of the College. They were communicated to the Academy by Dr Sadleir, the present Provost, and by our late lamented President, Provost Lloyd, that ardent patron of learning and talent, to whose affectionate and constant encouragement Mac Cullagh, in common with many others who have since distinguished themselves in the University, owed much of his subsequent success.

Previous to this, however, and whilst he was an undergraduate in the University, he had completed a new and original theory of the rotation of a solid body round a fixed point, of which he furnished a brief sketch to Provost Lloyd; this paper he did not publish, finding that he was anticipated in a portion of it by Poincot, as we shall hereafter have occasion to notice.

The next subject to which he turned his attention was the Wave Theory of Light, in which he afterwards became so eminent. At that time the laws of Double Refraction had been discovered by Fresnel; but to explain those laws on mechanical principles, that author had recourse to an hypothesis, simple, certainly, but so improbable as to be now considered inadmissible; from that hypothesis he succeeded in deducing the laws at which he had previously arrived, but by a process of calculation so complex, repulsive, and difficult, as to be almost unpresentable. It was on this subject that Professor Mac Cullagh communicated to the Academy his first paper, read June 21, 1830. Struck with the elegance of the laws, and with the simplicity of the hypothesis by which they were explained, he was dissatisfied with the difficulty of the process employed by Fresnel; and taking up

the subject on the same hypothesis, although never satisfied with it, he succeeded in deducing all the laws from the simplest geometrical considerations. In this first communication there was no new *physical* discovery, nor anything which had not been previously known, although there was abundance to show the original genius and power of the author, as well as much purely *mathematical*, which was perfectly new. On the same day he communicated also another paper on the "Rectification of the Conic Sections," and that again displayed no new *results*, but, like the other, simplicity and elegance of method. Since that period, however, he did arrive at several new and very beautiful theorems in that interesting subject, the chief of which will be found published in his Examination Papers in the Dublin University Calendar.

His next paper was read in the year he obtained fellowship, on the 28th of May, 1832. It originated in a contest between Laplace, Lagrange, and Sir James Ivory, in which the two latter denied the truth of an approximate theorem in the subject of attractions discovered by the former. In that paper Mac Cullagh showed, in the most simple and elegant manner, that the objectors were wrong, and that Laplace was right.

His next paper was read on the 24th of June, 1835, and was entitled "Geometrical Propositions applied to the Wave Theory of Light." In this again, although he displayed great originality, acuteness, and *geometrical* elegance, he arrived at no *physical* results which could be called strictly original, for his *two* cases of "Conical Refraction" had been previously discovered theoretically by Sir William Hamilton, and confirmed experimentally by Dr. Lloyd.

His first altogether original paper was read to the Academy on the 22nd of February, 1836. In that paper, he linked together, by a single and simple mathematical hypothesis, the peculiar and unique laws which govern the motion of light in its propagation through quartz; and having determined by observation of one set of phenomena the value of a particular constant occurring in his theory, he subjected that theory to the severe test of calculating numerically the results of another and wholly different set of phe-

nomena, and thence compared the results with observation, before he gave the theory in its published form to the Academy.

His next paper was also on the subject of Light, and in it again he made a great advance beyond the knowledge of the time. It was read to the Academy on the 9th of January, 1837, and was entitled, "On the Laws of crystalline Reflexion and Refraction." The problem discussed in that paper was completely solved and reduced to geometrical laws of the greatest simplicity and elegance, which had been but partially solved by Fresnel, in the particular case of *ordinary* media; and even this limited solution depended on inaccurate principles, and only gave the right results by a balancing of opposite errors. The laws discovered by Mac Cullagh in this paper were deduced from *four hypotheses*, unestablished certainly, but highly probable from their great simplicity and accordance with all previous physical notions. The truth of these hypotheses was *then* confirmed by their leading to results conformable to observation, but as yet they had not been accounted for on a single mechanical principle. It was in reference to the results published in this paper that Mr. Neumann, of Königsberg, subsequently advanced a claim of priority. The letter of Mr. Neumann to Sir William Hamilton, then President of the Academy, will be found in the first volume of the Proceedings; and the masterly defence of his own claims made by Professor Mac Cullagh, has been published in the pages immediately succeeding. He has there shewn that he was indebted to no man living for assistance on the subject of light, save to Fresnel alone; and his vindication of himself is so complete, that nothing more need be here said on the subject, except to remark that the results of greatest importance had not been arrived at by Mr. Neumann. Both had set out, independently of each other, from the same principles, and both had completely solved the question *analytically*, but the *geometrical interpretation* of the laws had been given by Professor Mac Cullagh only.

His next paper was presented to the Academy on the 9th of December, 1839. It was on "The *Dynamical* Theory of Crystalline Reflexion and Refraction." In this he verified all his preceding predictions respecting the laws of propagation and reflection, by showing that both sets of laws, although so widely different in their

nature, had, nevertheless, a common origin in a higher and more ultimate law, from which they were but particular deductions. In this paper he succeeded in deducing from a single physical hypothesis, and from strictly mechanical principles, all the known laws of crystalline propagation, reflection, and refraction.

This new theory he has since applied to the hitherto undiscovered laws of *total* reflection, and had succeeded in completely solving the problem in the particular case of an ordinary medium. This he has noticed in different places in the third volume of the Proceedings of the Academy. He had also succeeded in developing the whole problem in the general case, although in its complete form his theory was never published.

While he was thus discovering the true laws of that branch of physical science, he saw that a false theory on the same subject was proposed on the continent, and that, from the great name of its originator, it was gaining ground even in his own University. He immediately came forward and exposed the many errors and inconsistencies of that theory. This refutation will be found in the Proceedings of the Academy, Vol. II., page 189.

During all this period he also read before the Academy some highly original papers on purely mathematical subjects. Of these his paper "On Surfaces of the Second Order," published in the Proceedings, Vol. III., would have sufficed, had he written nothing else, to establish his reputation as a mathematician.

In 1838 Professor Mac Cullagh received from the Royal Irish Academy the Cunningham Medal, for his paper "On the Laws of Crystalline Reflection and Refraction." On presenting him with that medal, Sir William Hamilton, who was then our President, delivered an Address, which is printed in the Proceedings, and which contains a concise account of the then existing state of science, and a just tribute to the value of Mac Cullagh's discoveries.

In 1842 a still further recognition of his merits was made by the Royal Society, who awarded him the Copley Medal for his investigations in the theory of Light. On this occasion he had among his competitors for this high honour, Bessel, Dumas, and Murchison.

But it would be a great error to estimate the services which

Professor Mac Cullagh has rendered to the cause of science merely by his published works. The School of Mathematics, which was founded in the University by the writings, the example, and the energy of Provost Lloyd, owes much of the success that has continued to attend it, since the death of its founder, to the zeal and spirit of Mac Cullagh. His lectures, first in the chair of Mathematics, and for the last four years in the chair of Natural Philosophy, have undoubtedly given an impulse to the study of the severer sciences, which cannot be regarded without astonishment by those who remember the state of mathematical and physical learning in Trinity College when Provost Lloyd began his labours. The change seems almost incredible, when we consider the short period of time in which it has been effected, the great amount of scientific knowledge which is now common even among undergraduates, and the number of eminent young men who have imbibed the spirit of Mac Cullagh, and are ready to walk in his footsteps. In this more private sphere of usefulness Professor Mac Cullagh has done much to deserve the gratitude of his country, and the affectionate remembrance of his contemporaries in the University.

The following account of his lectures delivered to the candidates for Fellowships, as Professor of Natural Philosophy, is from the pen of one who has deeply profited by his instructions, and who now holds a high and well-merited station in Trinity College. It is contained in a letter written soon after his decease, and addressed to Sir William Hamilton.*

“I allude to these lectures, because it was in the delivery of them that Professor Mac Cullagh ever appeared to the greatest advantage; it was there that he used to display the extensive information, the elaborate research, and the vast acquired treasures of his highly cultivated mind; and it was there that he turned to account the noble faculty of inventive genius with which he was so

* This letter was communicated to the Marquis of Northampton, as President of the Royal Society, and extracts from it have already appeared in the notice of Professor Mac Cullagh, given by his Lordship in his Address to that body, on the 30th of November last. See London, Edinburgh, and Dublin Philosophical Magazine, for March, 1848, p 219.

eminently gifted, in improving, by means of it, every subject he ever handled. There is no one capable of appreciating such subjects, who will not agree with me, that during the several years of his purely mathematical lectures nothing could exceed the depth, or surpass the exquisite taste and elegance, of all his original conceptions, both in analysis and in the ancient geometry in which he delighted. Nor will it be denied, by any one who was so happy as to possess the opportunity of judging, that during the last three years and a half in which he filled the chair of Natural Philosophy, his earnest endeavour was to instil sound and accurate physical conceptions into the minds of his hearers, and to array them, when stated into mathematical language, in all the charms which result from true taste and refinement.

“ In his first course of lectures (on the Rotation of a solid Body round a fixed Point), he completely solved the case of a body abandoned to its own motions, on receiving a primitive impulse in any direction, under the action of no accelerating forces. This problem he had finished several years before, and was preparing it for publication, when he was anticipated by Poinso^t, who published a very elegant tract on the subject. Both theories are founded on the same principles, and exhibit the effects of the forces in different positions of the body, as well as the actual motions of the body itself, by means of an ellipsoid described round the fixed point as a centre. But they differ in employing, not the same but reciprocal ellipsoids, which, though seemingly unimportant, makes this difference, that Mac Cullagh’s method, although not superior in clearness or elegance, had the prodigious advantage of enabling him to throw his geometry into the analytical form, and to deduce, from the simplest geometrical considerations, the elliptic integrals which expressed the circumstances of the motion, such as the times of oscillation, revolution, &c. This method also enabled him to find several interesting properties, which Poinso^t’s mode of treating the question did not so readily exhibit, and which Poinso^t had in fact omitted to notice. Some of these results were since published by Professor Mac Cullagh in the Proceedings of the Academy. Indeed the whole discussion, which is in existence in its first form, as delivered by himself, is highly original, interesting, and instructive,

and, notwithstanding its being partially anticipated by Poincot, is well worthy of publication.

“In his course of lectures on Attractions he gave some very beautiful theorems respecting the attraction of a body of any nature and form, on a point distant a long way in comparison of its own dimensions; by an original and very ingenious method, he deduced the beautiful theorem of Chasles on the attractions of any two confocal ellipsoids on the same external point; and subsequently applying his results to the problem of the figure of the earth, he deduced with ease the well-known and celebrated theorem of Clairaut.

“In the same course of lectures he gave also some most simple and elegant geometrical methods for finding the laws of attraction of an homogeneous ellipsoid on any internal point, with several other ingenious and beautiful theorems, which it would be tedious to particularize. The subject of attractions seems indeed to have been a favourite one with him; on several previous occasions in the course of his lectures he gave new and beautiful theorems in it, and in many important respects improved the existing theories, keeping always in advance of the knowledge of his time. . . .

“I now come to his great course of lectures on ‘The Dynamical Theory of Light,’ the unaided creation of his own surpassing genius, and to the statement of the single and simple hypothesis upon which, as a basis (to borrow the language of Dr. Lloyd when speaking of Fresnel’s beautiful theory of double refraction), Professor Mac Cullagh ‘has reared the noblest fabric which has ever adorned the domain of physical science, Newton’s system of the universe alone excepted.’ When I say that *I* think Professor Mac Cullagh ranks as a philosopher higher than Fresnel in the region of Light (and if *that* be admitted he will certainly rank inferior to none on that subject), I do not at all institute any comparison between labours so different in their nature as those of these two great men. Professor Mac Cullagh, I conceive, stands to Fresnel in the same relation as Newton to Kepler. The latter, undoubtedly, discovered all the elegant laws of the *propagation* and double refraction of light in crystallized media, as well as those of ordinary with some of those of total *reflection* at the bounding surfaces of *ordinary* media, but he did not account for

them on any correct mechanical principles. With respect to *propagation*, the very first principles from which he sets out are such as cannot be admitted; with respect to *ordinary* reflection, he partly accounted for them on correct principles, in the particular case of ordinary media; and with respect to *total* reflection, his beautiful empirical laws are well known, but he did not account for them at all, even in the simple case of ordinary media, which was the only one for which he had ever given them. Professor Mac Cullagh, on the contrary, not only deduced the known laws in all the three cases from mechanical principles of a nature so simple and probable, as that they cannot but bear conviction of their truth to any mind reflecting on them with anything like the attention they undoubtedly deserve; but he also gave the general equations of the motion of the propagation of light, not only in all known media, but also for *all* media which could ever be discovered, or even conceived; and with them he gave also the general conditions which must be fulfilled at the common bounding surface of every two not only known but conceivable media, and which in every case give all the laws of reflection and of refraction, whether ordinary or total. Thus did he deliver to us and to posterity a perfect and complete *mechanical* theory,—*analytically complete*,—so that any one who in future may attempt to *discover* in this region of science can only do so by treading in his steps, and adopting his correct principles, but can never supersede them; in fact he has discovered and handed down to us the *general principles* which *must* hold in all cases, and it remains for future investigators only to *apply* them.

“He himself applied them to the two most general cases of *propagation*, viz., of polarized waves of undiminishing intensity in a crystalline medium, and of that peculiar species of propagated vibrations which take place in the rarer medium, in every case of *total reflection* at the surface either of an ordinary or of a crystalline medium; in the former case he arrived at *all the laws of propagation* in *crystalline* media which were discovered by Fresnel, with one single variation, and that the very one on which he himself had long previously corrected Fresnel, viz., the vibrations of the ether, which in place of being *perpendicular* to the plane of

polarization, as Fresnel had supposed, were found, on the contrary, to be *parallel* to that plane, as Mac Cullagh himself had supposed.

“ He was enabled also from the same theory to deduce again, in a far easier manner, all the beautiful geometrical laws of crystalline reflection and refraction, which he had formerly laid before the Royal Irish Academy in 1837, and for which that body awarded him the honorary distinction of the Conyngham Medal, which I have before alluded to. And they fully confirmed the acute prophecy then made by his sagacious mind, on finding to his astonishment, that a law of reflection depended for its existence on the existence of a law of propagation ; when he said that the law of *vis viva* which he had assumed at the outset could not be a fundamental, but rather a secondary law, and remarked that perhaps the next step in physical optics would be the deduction, as parts of one system, of all the laws, both of propagation and reflection, from some higher and more general law, containing them both as particular cases : anticipations which were singled out for special attention in the Address delivered by Sir W. Rowan Hamilton, on the occasion already referred to. How little, perhaps, did Professor Mac Cullagh then know that both of his own prophecies were destined to be so soon fulfilled, and both by the powers of his own mighty and creative mind !

“ In the general case of total reflection at the surface of a crystal, he afterwards showed, by a most ingenious employment of imaginary quantities, that the refraction was still double, and never more than double ; and he showed that the directions of the refracted rays remained always the same, whatever were the incidence, provided it gave total reflection. Again, as he had done for the case of ordinary reflection by means of his beautiful theorem of the polar plane, so in the case of total reflection he determined the two directions of polarization, in a given incident plane polarized wave, which would give uniradial refracted rays, by means not of a polar plane, but of a polar cylinder, which he succeeded in showing was the analogous surface in the more difficult case. And finally, by means of the circular sections of the ellipsoid apsidal to the surface of indices, he showed how to determine completely, in plane, posi-

tion, and figure, the two ellipses of vibration corresponding to any given incident wave polarized in any azimuth, and incident at any angle greater than the angle of total reflection.

“In the particular case of total reflection at the surface of an *ordinary* medium, the whole theory of total reflection became exceedingly simple, and that case was left by him *completed*. He showed that whatever were the incidence, the refracted wave was always perpendicular to the intersection of the planes of incidence, and of the surface of the crystal. He showed that the axes of the ellipse of vibration projected on the plane of incidence, were parallel and perpendicular to that line, and the duration of vibration the same as in the general case. He gave a beautiful construction, by means of an equilateral hyperbola, touching with its vertex the section of the index sphere at the point where it intersects the same right line, for determining the velocity of the refracted wave, and the ratio of the axes of its elliptic vibrations corresponding to any given incidence. He determined the *limiting angle of total reflection*. And finally, he demonstrated the *two* empirical formulæ of Fresnel, for the *acceleration* of the refracted *phase* over the incident, and the subsequent *equal acceleration* of the reflected phase over the refracted; the one for the case of the incident light polarized *in* the plane of incidence, and the other for the same polarized in the perpendicular plane.

“For *all* cases, whether of propagation or of reflection, ordinary or total, the whole theory, as he has left it to us, is *analytically* complete; but the *geometrical* interpretations, in the general case of total reflection at the surface of a crystal, present very great difficulties. Many of these his acute intellect had, with great labour, surmounted; he had been working hard at the subject for the last six weeks of his life, and with so much success, that he had actually commenced a new paper for the Transactions of the Academy, embodying the results of his latest investigations.”

But the services for which this Academy owes to Professor Mac Cullagh a debt of lasting gratitude, are not confined to his scientific labours and discoveries. His enlightened patriotism led him, even at the risk of diminishing his own fame, or at least of retarding his progress to celebrity, to publish his researches in Ire-

land, rather than avail himself of the many other means of publication that were open to him, and where his papers would have received a wider as well as a speedier circulation.

The same enlarged views enabled him also to appreciate the value of other branches of knowledge, which a man of less cultivated mind might be tempted to underrate, when viewed in the light of his own favourite and more dazzling studies. But it is to Mac Cullagh, to his splendid example of munificence, and to his untiring zeal, that we owe the creation of the spirit which led to the formation of our Museum of Antiquities, that has already attracted so much public attention, and which constitutes so important a feature in the present position of the Academy.

The Cross of Cong was the gift of Mac Cullagh to our national Museum, purchased at his own sole expense. On the 24th June, 1839, he presented it himself to the Academy, at a general meeting, and, after some remarks on its historical importance and value, he stated that his motive for presenting it to the Academy was "to save it from the shameful process of destruction to which everything venerable in Ireland has been exposed for centuries, and to contribute, at the same time, to the formation of a national collection, the want of which, he had been told, was regarded by Sir Walter Scott as a disgrace to a country so abounding in valuable remains. He trusted" (he said) "that the time was not far distant when that reproach would be no longer merited,—when the relics of antiquity, now scattered over the kingdom, would find their way to a place where they could be appreciated, studied, and preserved. He believed, indeed, that there already existed in the public mind a strong disposition in favour of such a plan, a disposition that only required to be awakened into action."*

He had himself the pleasure to see this anticipation realized, and to feel that he was greatly instrumental in awakening into action the disposition of which he then spoke. His spirit was immediately caught up by others, and the golden torques of Tara were purchased by a subscription, and deposited, with the Cross of Cong, in the Museum of the Academy.

* Proceedings, Vol. I. p. 328.

Nor is this the only occasion on which Mac Cullagh showed his zeal in the cause of our national antiquities. More recently, when it was understood that the Domhnach Airgid was to be had,—a reliquary which Mr. Petrie had made known to us, and which contains the fragments of a manuscript copy of the Gospels, which may be regarded as of the fifth century,—Mac Cullagh again stepped forward, and paid down, from his own pocket, the sum of £300, in order to secure this interesting relic to the Academy, and to obviate the difficulty arising from the delay that must necessarily attend a public subscription. In this case, although his own contribution was a handsome one, yet he did not, of course, pay the whole cost of the purchase; but the zeal he exhibited was undoubtedly the means of securing the Domhnach for our Museum, and entitles him to the lasting gratitude of all lovers of our antiquities.

Of his private life and character it is unnecessary to speak in the presence of so many to whom he was intimately known, and by whom his virtues were fully appreciated. Quiet, unobtrusive, modest, unaffected, he was, perhaps the most entirely unselfish of human beings. His private charities were extensive, although known to but few; he was generous to a fault; and his readiness to assist the struggling and the poor often exposed him to the danger of being imposed upon. With the keenest relish for society, he was retired and almost ascetic in his private habits; and there was something in the purity of his character which commanded for him universal respect. No man living ever heard a light or ribald word from his lips; few, however hardened, would have ventured such a word in his presence. His religious opinions were strictly those of the Church to which he belonged, and were founded on the deepest and most cordial conviction, derived, in his case, not from acquiescence in the judgment of others, but from the fullest and most extensive examination of the subject for himself. This was, in fact, one of the most singular parts of his character, which can be best appreciated by those alone who were familiarly acquainted with him; for his horror of ostentation on such a subject carried him in general to the opposite extreme, and he observed on all religious questions an habitual reserve, which was only broken when an occasion presented itself of rebuking irreverence or refuting scepticism.

Of the fatal malady which preyed upon his spirit, and deprived society of one of its brightest ornaments, enough is already known to every one here. Severe mental application combined with other causes to produce the aggravated attack of dyspepsia, which, in the mysterious dispensations of Providence, was permitted to obtain the mastery over a mind of peculiar sensibility and refinement ; and, on the 24th of October last he concluded his short but bright career.

The REV. ROBERT TRAIL fell a victim to the fatal dysentery, which he caught from his unceasing and indefatigable labours among the poor of the remote parish of Schull, of which he was rector ; a district where the distress of the late disastrous season prevailed to an alarming excess, and where Dr. Trail's energetic exertions will long be remembered with gratitude by all classes of his parishioners. He was removed in the midst of usefulness, with the conviction that, although he perished himself in the attempt, his advice, his labour, and his purse, were, nevertheless, the means of saving the life and health of many of the poor around him. As a member of the world of letters, Dr. Trail was the author of some sermons and controversial works ; but at the time of his death he was engaged in the laborious and elaborate work of translating and editing the works of Josephus, with illustrations of great beauty and elegance, which he had obtained at very great expense, from drawings made expressly for himself in the Holy Land.

The last on our list of lost members is one who must also be reckoned among the number of those who have suffered in this country from the effects of the late unparalleled season of disease and misery. Dr. CURRAN* was a native of the county of Down, having been born near Lisburn in the year 1819. In 1833 he entered the University of Glasgow, and in 1838 he was removed to the University of Dublin, where he took the first degree in medicine in 1843. Besides the laborious studies necessary for his Profession, to which he was devotedly attached, Dr. Curran found leisure for the successful study of modern languages ; and in the University he was distinguished

A memoir of Dr. Curran, to which we are indebted for the facts here stated, has appeared in the Dublin Medical Journal.

by his taste for the mathematical and philosophical sciences, and particularly for astronomy. Immediately after taking his degree he proceeded to Paris, for the purpose of attending the Parisian hospitals, and cultivating the acquaintance of the eminent medical men of that metropolis. He returned to Ireland after an absence of about a year, and in 1846 was elected a Licentiate of the College of Physicians in Dublin. His value was soon discovered by his professional brethren, and he was chosen immediately Professor of Medicine to the School of the Apothecaries' Hall, one of the Physicians to the Dublin General Dispensary, and Secretary to the Council of the Pathological Society. In 1846 he returned to the Continent, chiefly for the purpose of visiting the principal lunatic asylums there, and during his tour he became known to several of the medical societies of France, Belgium, and Holland, many of which conferred on him their honorary or corresponding diplomas.

Dr. Curran's writings were chiefly confined to some few articles in the periodical literature of his profession ; which are, however, distinguished for their research and clearness of style.

In the latter end of the past summer, two medical gentlemen, M. Rodier and M. Henri Gueneau De Mussy, were sent over to Dublin by the French Government, to study the character of the epidemic here, and to inquire into the management of fever. M. De Mussy had previously been an acquaintance and friend of Dr. Curran, who became his guide through the pestilential abodes of the sick. M. De Mussy contracted a typhus fever of the worst description, during which Dr. Curran was his constant nurse and indefatigable attendant. He was soon himself also seized with the disease in its most fatal form ; and, notwithstanding all the skill and aid of his professional brethren, he declined rapidly on the ninth day of the fever, and expired on Sunday morning, the 26th day of September last, in the twenty-eighth year of his age. Thus perished, in the prime of youth, and in the midst of the brightest prospects of professional celebrity, one of the most promising young physicians of Dublin ; and a man whose benevolent, disinterested, and affectionate character in private life, had endeared him to all his friends.

The Report was ordered to be entered on the Minutes.

The Ballot for the Annual Election having closed, the scrutineers reported that the following gentlemen were elected Officers and Council for the ensuing year :

President.—Rev. Humphrey Lloyd, D. D.

Treasurer.—Robert Ball, Esq.

Secretary to the Academy.—Rev. James H. Todd, D. D.

Secretary to the Council.—Rev. Charles Graves, A. M.

Secretary of Foreign Correspondence.—Rev. Samuel Butcher, A. M.

Librarian.—Rev. William H. Drummond, D. D.

Clerk and Assistant Librarian.—Edward Clibborn.

Committee of Science.

Rev. Franc Sadleir, D. D., Provost ; James Apjohn, M. D. ; Robert Ball, Esq. ; Sir Robert Kane, M. D. ; George J. Allman, M. D. ; Sir William R. Hamilton, LL. D. ; Rev. Samuel Haughton, A. M.

Committee of Polite Literature.

The Archbishop of Dublin ; Rev. William H. Drummond, D. D. ; Rev. Charles W. Wall, D. D. ; John Anster, LL. D. ; Rev. Charles Graves, A. M. ; Rev. Samuel Butcher, A. M. ; Rev. James Wilson, D. D.

Committee of Antiquities.

George Petrie, LL. D., R. H. A. ; Rev. James H. Todd, D. D. ; J. Huband Smith, A. M. ; Captain Larcom, R. E. ; William R. Wilde, M. D. ; F. W. Burton, Esq. ; Samuel Ferguson, Esq.

The President then appointed, under his hand and seal, the following Vice-Presidents :

Sir William R. Hamilton, LL. D. ; Rev. Franc Sadleir, D. D., Provost, Trinity College ; Rev. Charles W. Wall, D. D. ; and His Grace the Archbishop of Dublin.